LAB #5: Processing of Multi Beam Echo-Sounding Data

Part B: Generation of Georeferenced Bathymetry

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Course Code: ESSE 4650

Introduction

This is the second part of the multi-beam lab where students are to process Georeferenced Bathymetry data.

Methodology and Results

Deliverable B1 and B2

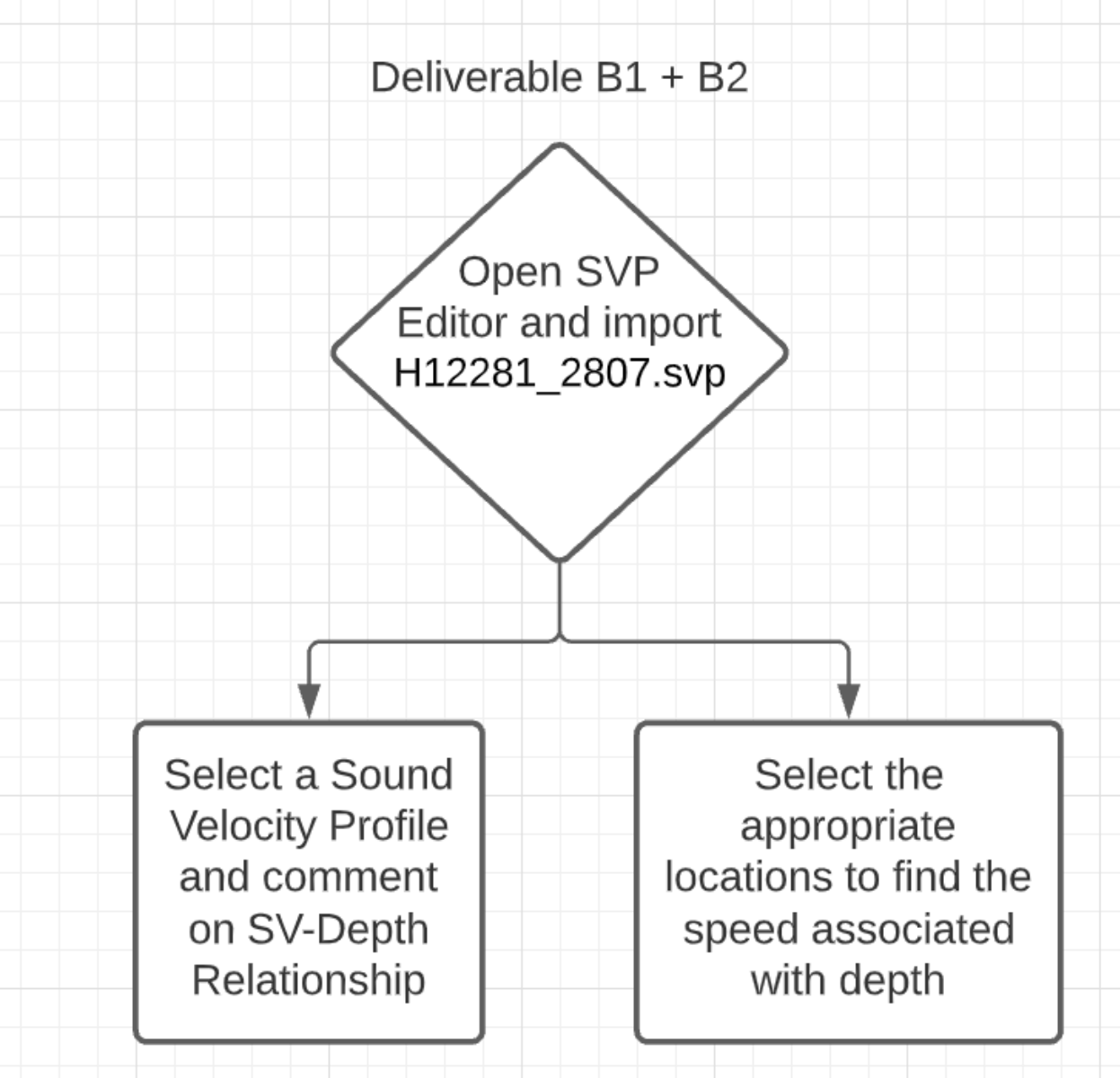


Figure 1: Deliverable B1 and B2 Workflow

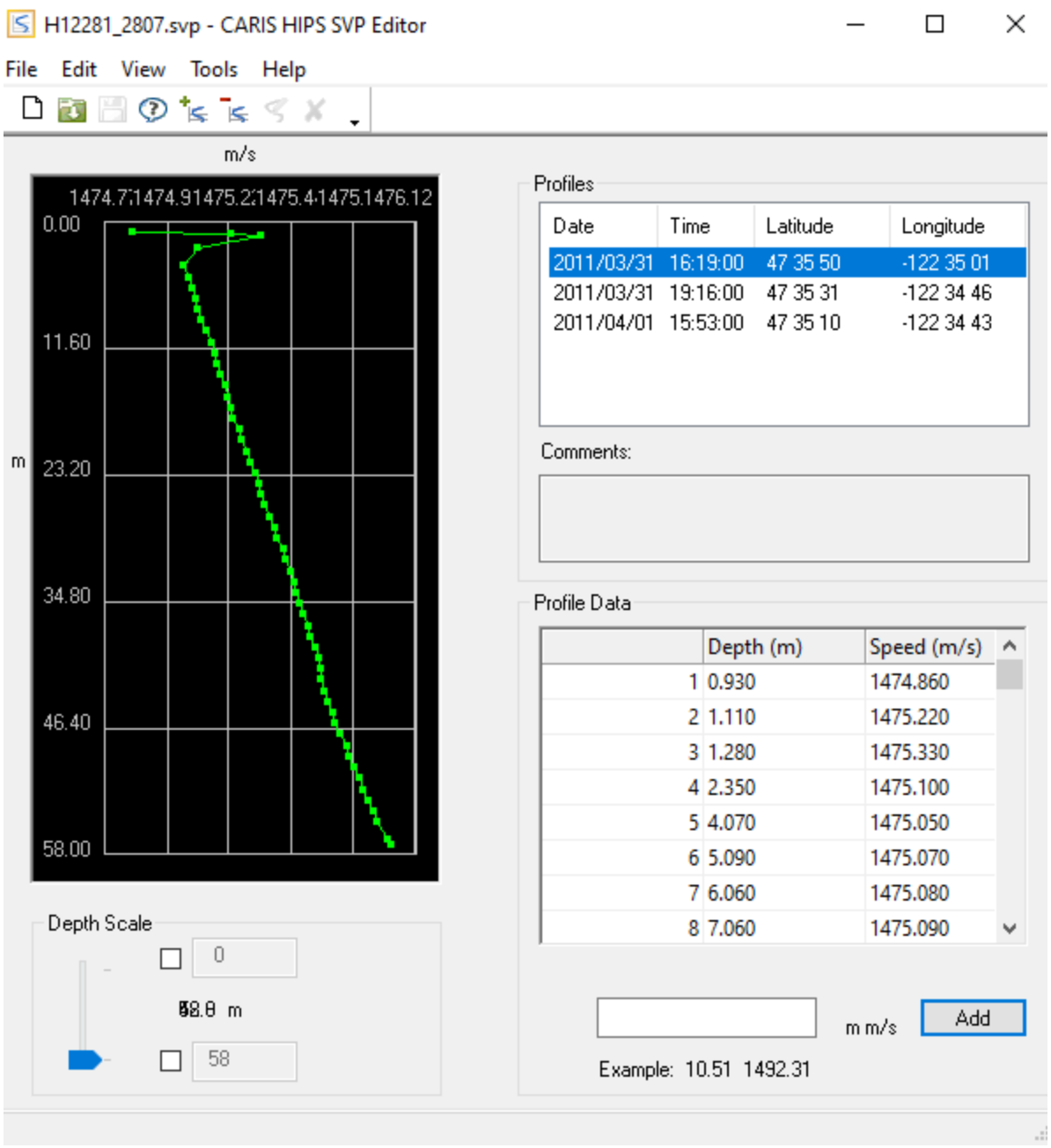


Figure 2: Screenshot of Sound Velocity Profile

The speed of the sound in water increases rapidly and reaches a spike then rapidly decreases. From there, it gradually increases its speed in the water. Since these depths are recorded under 60m, the speed could be beginning to enter the thermocline or halocline region due to its short depth.

Table 1: Depth and Speed Table at Lat: 47°35’ 31”; Lon: -112°34’46”

Depth (m)	Speed (m/s)
1.24	1475.48
10.04	1475.27
25.04	1475.45
41.02	1475.56

Table 2: Depth and Speed Table at Lat: 47°35’10”; Lon: -112°34’43”

Depth (m)	Speed (m/s)
0.86	1475.42
10.08	1475.35
25.02	1475.47
39.98	1475.70

Deliverable B3

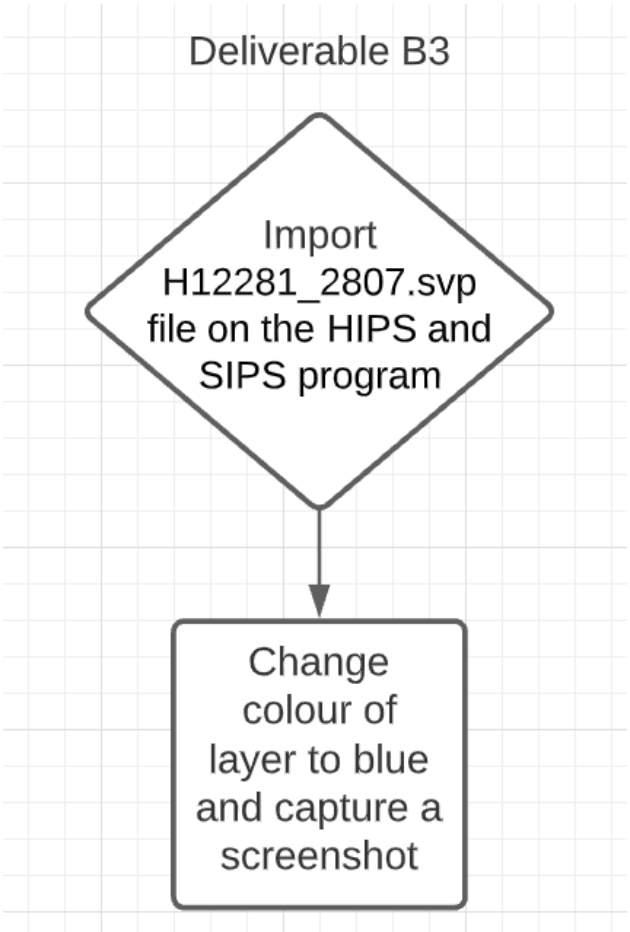


Figure 3: Workflow of Deliverable B3

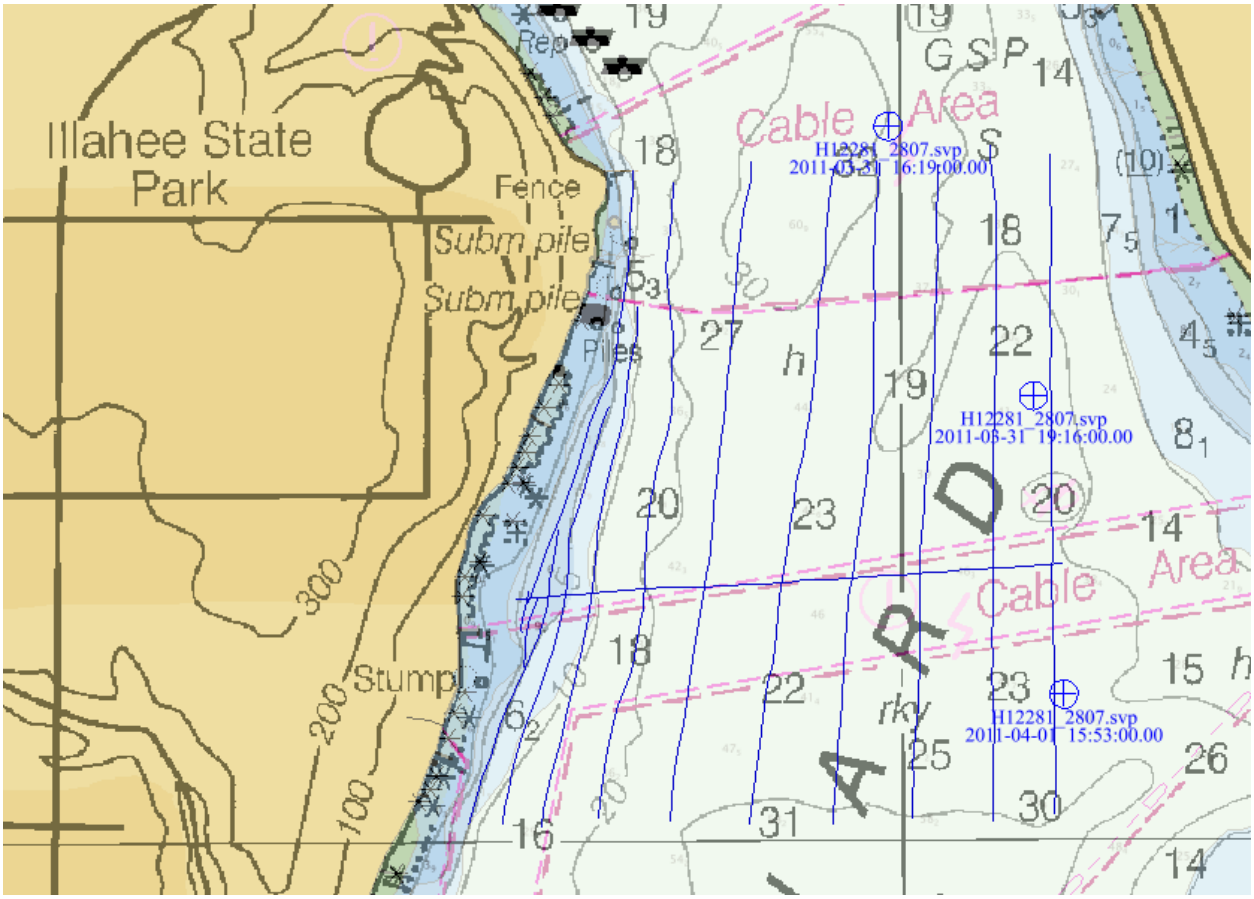


Figure 4: Screenshot of Sound Velocity Casts

Deliverable B4

a)

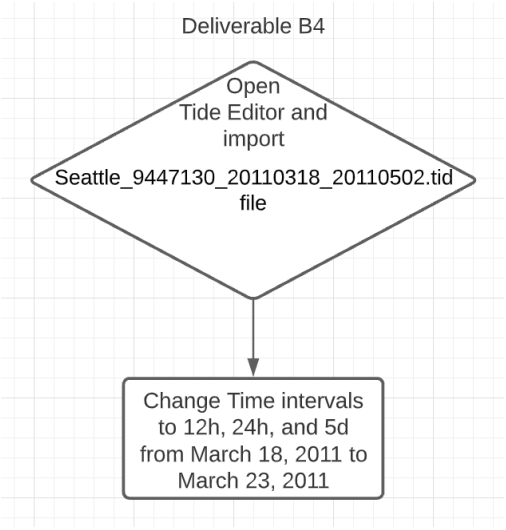


Figure 5: Workflow for Deliverable B4

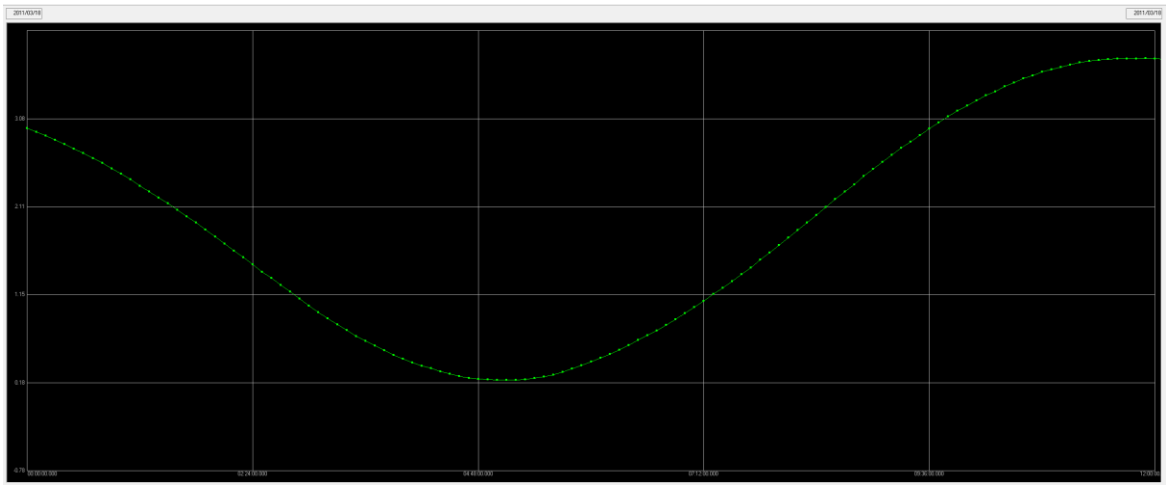


Figure 6: Tide Graph from 00:00 to 12:00

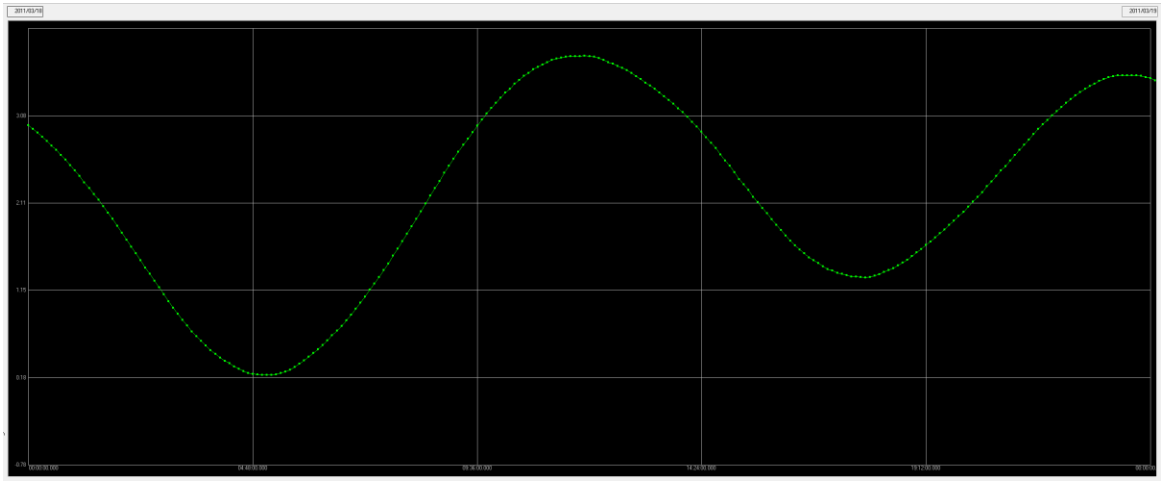


Figure 7: Tide Graph from 00:00 to 24:00

b)

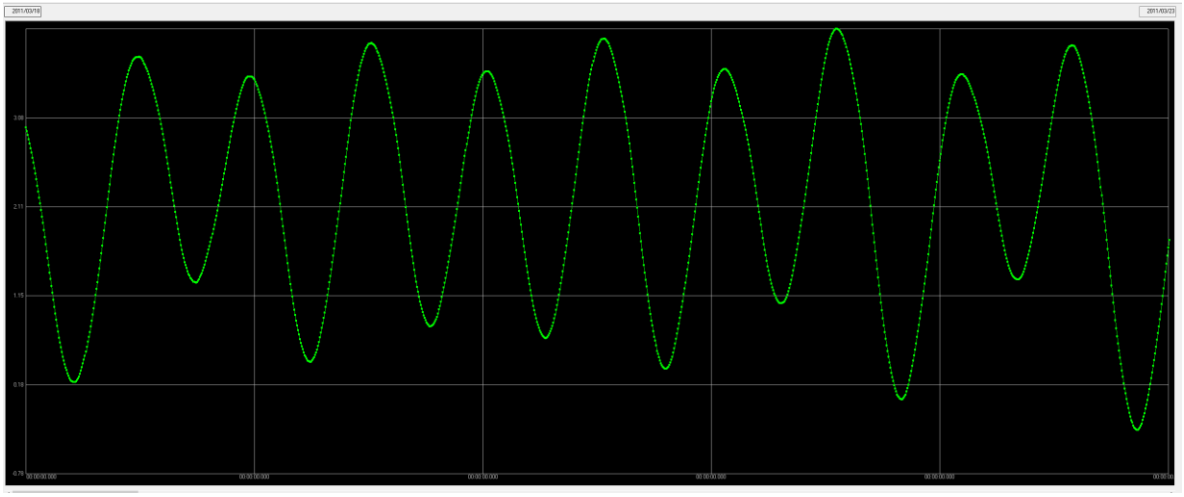


Figure 8: Tide Graph from March 18 to March 23

Deliverable B5

The Total Propagated Uncertainty (TPU) is composed of uncertainty estimates of the contributing sensors in the multi-beam survey. For example, it's the errors of the transducer, navigation, SVP 1, and other sensors that we selected from lab 4. It's computed by finding the errors in the depth and horizontal position:

$$\sigma_D = \sqrt{\sigma_d^2 + \sigma_{D_H}^2 + \sigma_{D_D}^2 + \sigma_{D_W}^2} \ \ldots$$

Figure 9: Reduced Depth Uncertainty

$$\sigma_{p_{Final}} = \sqrt{\sigma_p^2 + \sigma_{p_a}^2 + \sigma_{p_t}^2} \ \ldots$$

Figure 10: Total Positioning Uncertainty

Deliverable B6

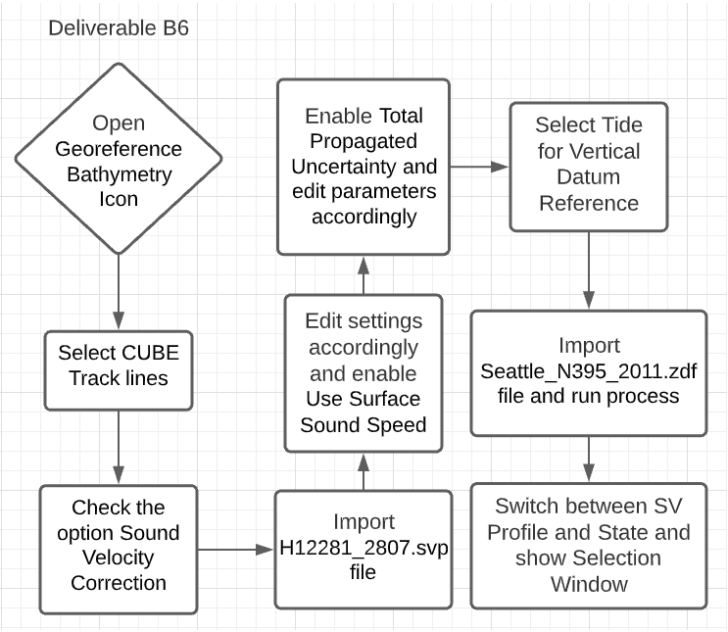


Figure 11: Deliverable B6 Workflow

SV Profile

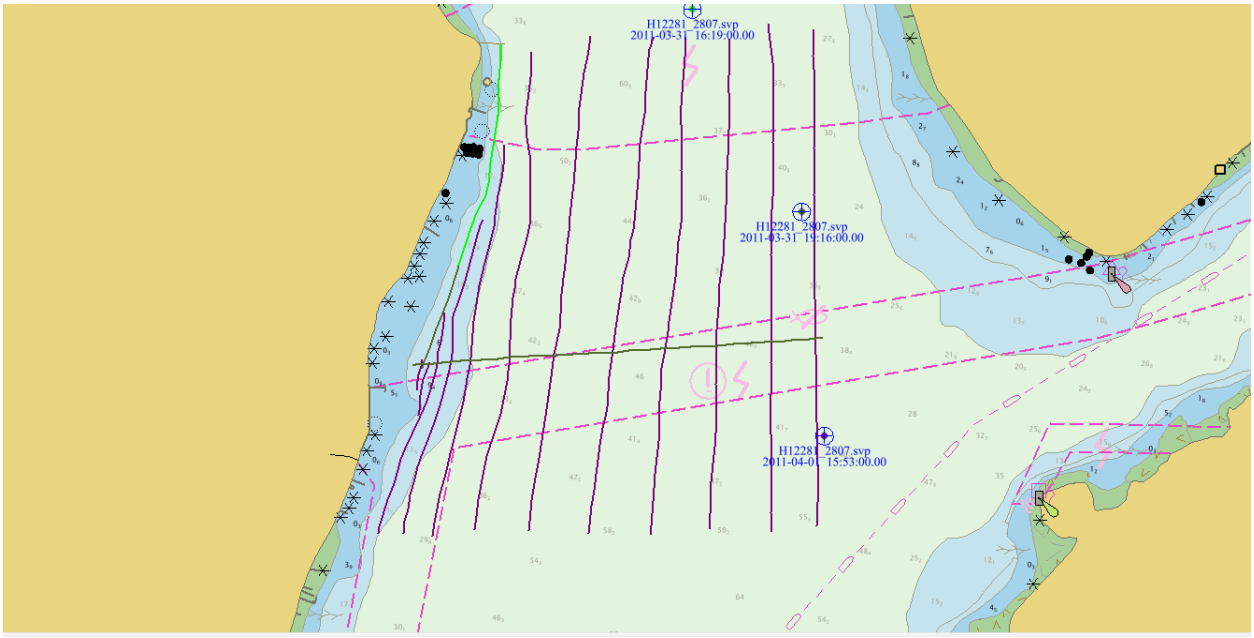


Figure 12: Colour Survey Lines of SV Profile

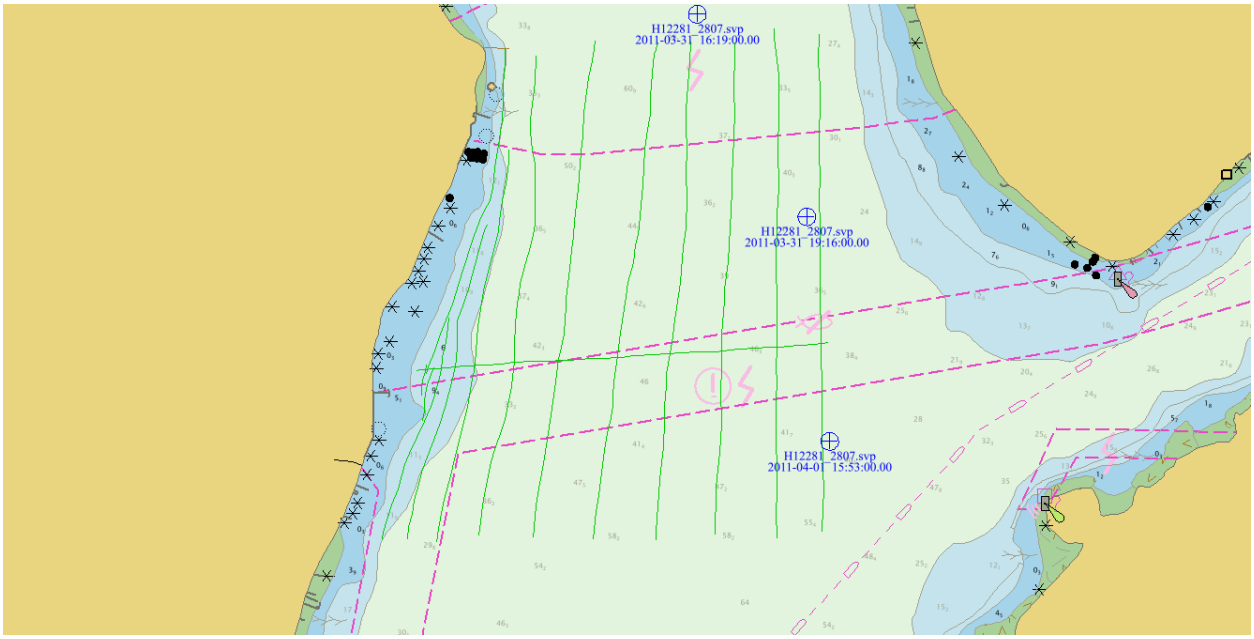
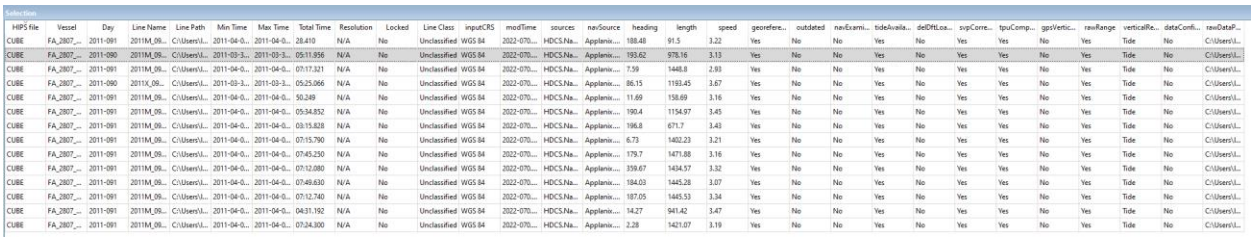


Figure 13: Colour Survey Lines of State



HIPS file	Vessel	Day	Line Name	Line Path	Min Time	Max Time	Total Time	Resolution	Locked	Line Class	inputCRS	modTime	sources	navSource	heading	length	speed	georefere...	outdated	navExami...	tideAvaila...	delDftLoa...	svpCorre...	tpuComp...	gpsVertic...	rawRange	verticalRe...	dataConfi...	rawDataP...
CUBE	FA_2807_...	2011-091	2011M_09...	C:\Users\J...	2011-04-0...	2011-04-0...	28.410	N/A	No	Unclassified	WGS 84	2022-070....	HDCS,Na...	Applanix....	188.48	91.5	3.22	Yes	No	No	Yes	No	Yes	Yes	No	Yes	Tide	No	C:\Users\J...
CUBE	FA_2807_...	2011-090	2011M_09...	C:\Users\J...	2011-03-3...	2011-03-3...	05:11.956	N/A	No	Unclassified	WGS 84	2022-070....	HDCS,Na...	Applanix....	193.62	978.16	3.13	Yes	No	No	Yes	No	Yes	Yes	No	Yes	Tide	No	C:\Users\J...
CUBE	FA_2807_...	2011-091	2011M_09...	C:\Users\J...	2011-04-0...	2011-04-0...	07:17.321	N/A	No	Unclassified	WGS 84	2022-070....	HDCS,Na...	Applanix....	7.59	1448.8	2.93	Yes	No	No	Yes	No	Yes	Yes	No	Yes	Tide	No	C:\Users\J...
CUBE	FA_2807_...	2011-090	2011X_09...	C:\Users\J...	2011-03-3...	2011-03-3...	05:25.066	N/A	No	Unclassified	WGS 84	2022-070....	HDCS,Na...	Applanix....	86.15	1193.45	3.67	Yes	No	No	Yes	No	Yes	Yes	No	Yes	Tide	No	C:\Users\J...
CUBE	FA_2807_...	2011-091	2011M_09...	C:\Users\J...	2011-04-0...	2011-04-0...	50.249	N/A	No	Unclassified	WGS 84	2022-070....	HDCS,Na...	Applanix....	11.69	158.69	3.16	Yes	No	No	Yes	No	Yes	Yes	No	Yes	Tide	No	C:\Users\J...
CUBE	FA_2807_...	2011-091	2011M_09...	C:\Users\J...	2011-04-0...	2011-04-0...	05:34.852	N/A	No	Unclassified	WGS 84	2022-070....	HDCS,Na...	Applanix....	190.4	1154.97	3.45	Yes	No	No	Yes	No	Yes	Yes	No	Yes	Tide	No	C:\Users\J...
CUBE	FA_2807_...	2011-091	2011M_09...	C:\Users\J...	2011-04-0...	2011-04-0...	03:15.828	N/A	No	Unclassified	WGS 84	2022-070....	HDCS,Na...	Applanix....	196.8	671.7	3.43	Yes	No	No	Yes	No	Yes	Yes	No	Yes	Tide	No	C:\Users\J...
CUBE	FA_2807_...	2011-091	2011M_09...	C:\Users\J...	2011-04-0...	2011-04-0...	07:15.790	N/A	No	Unclassified	WGS 84	2022-070....	HDCS,Na...	Applanix....	6.73	1402.23	3.21	Yes	No	No	Yes	No	Yes	Yes	No	Yes	Tide	No	C:\Users\J...
CUBE	FA_2807_...	2011-091	2011M_09...	C:\Users\J...	2011-04-0...	2011-04-0...	07:45.250	N/A	No	Unclassified	WGS 84	2022-070....	HDCS,Na...	Applanix....	179.7	1471.88	3.16	Yes	No	No	Yes	No	Yes	Yes	No	Yes	Tide	No	C:\Users\J...
CUBE	FA_2807_...	2011-091	2011M_09...	C:\Users\J...	2011-04-0...	2011-04-0...	07:12.080	N/A	No	Unclassified	WGS 84	2022-070....	HDCS,Na...	Applanix....	359.67	1434.57	3.32	Yes	No	No	Yes	No	Yes	Yes	No	Yes	Tide	No	C:\Users\J...
CUBE	FA_2807_...	2011-091	2011M_09...	C:\Users\J...	2011-04-0...	2011-04-0...	07:49.630	N/A	No	Unclassified	WGS 84	2022-070....	HDCS,Na...	Applanix....	184.03	1445.28	3.07	Yes	No	No	Yes	No	Yes	Yes	No	Yes	Tide	No	C:\Users\J...
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CUBE	FA_2807_...	2011-091	2011M_09...	C:\Users\J...	2011-04-0...	2011-04-0...	04:31.192	N/A	No	Unclassified	WGS 84	2022-070....	HDCS,Na...	Applanix....	14.27	941.42	3.47	Yes	No	No	Yes	No	Yes	Yes	No	Yes	Tide	No	C:\Users\J...
CUBE	FA_2807_...	2011-091	2011M_09...	C:\Users\J...	2011-04-0...	2011-04-0...	07:24.300	N/A	No	Unclassified	WGS 84	2022-070....	HDCS,Na...	Applanix....	2.28	1421.07	3.19	Yes	No	No	Yes	No	Yes	Yes	No	Yes	Tide	No	C:\Users\J...

Figure 14: Selection Window Showing Georeference and All Corrections Applied